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Study on the efficacy of arthroscopic surgery for patients with rotator cuff injury and the progress of postoperative rehabilitation treatment

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ABSTRACT
Patients with rotator cuff injuries exhibit symptoms of joint pain and restricted range of motion, which significantly affect the normal function of the shoulder. Effective treatment is essential for these patients. This article analyzes the efficacy of currently recommended arthroscopic surgeries in clinical practice and reviews the advancements in postoperative rehabilitation treatments to provide a robust reference for the rapid recovery of shoulder joint function in patients with rotator cuff injuries.

KEYWORDS
rotator cuff injury; arthroscopic surgery efficacy; rehabilitation treatment progress

The rotator cuff is composed of tissues such as the supraspinatus muscle, the minor round muscle, the infraspinatus muscle and the subscapular muscle, which are similar to the muscles with sleeve shape[1]. During exercise, the rotator cuff muscles can perform activities such as internal rotation, abduction, and elevation of the shoulder, which help stabilize the humeroulnar joint to maintain the joint cavitys seal and ensure that lubricants provide nutrients to the articular cartilage. However, when the rotator cuff is injured or blood supply decreases, such as due to sports injuries, impact trauma, rotator cuff wear, degeneration, and other contributing factors, rotator cuff injuries may occur. According to clinical statistics on shoulder diseases, rotator cuff injuries account for 50-85%, and the incidence of rotator cuff injuries increases with age, being significantly higher in individuals aged 60-90 years[2]. After shoulder cuff injury, patients initially present with shoulder pain, difficulty in abduction, elevation, and internal and external rotation activities. In later stages, weakness in the shoulder and atrophy of the supraspinatus and deltoid muscles may occur, causing significant inconvenience to daily life and severely impacting quality of life. Therefore, active and effective treatment for shoulder cuff injuries should be provided to prevent disease progression, alleviate pain, restore shoulder function, and improve quality of life.

1 Efficacy of arthroscopic surgery

Clinically, the treatment of rotator cuff injuries is mostly divided into two surgical procedures: non-surgical treatment and surgical treatment. For newly occurring rotator cuff injuries, conservative treatment can be performed, including immobilizing the affected shoulder, taking oral medication, local pain injections, and rehabilitation therapy to improve symptoms, inhibit disease progression, and prevent joint instability, spasm, and severe functional impairment. For patients with multiple unsuccessful conservative treatments or larger tendon tears in the rotator cuff, surgical treatment is considered. Some scholars point out that patients with rotator cuff injuries who have not responded well to conservative treatment within 1-3 months should undergo surgical treatment as soon as possible[3].Current surgical treatments include open surgery and arthroscopic surgery. Open glenoid repair is a simpler open surgical method, but it causes more trauma to the patient, potentially reduces muscle strength during the removal of the deltoid muscle, and can easily lead to complications such as adhesive capsulitis of the shoulder joint, affecting the movement of the glenoid. Compared to traditional open surgery, minimally invasive glenoid repair has smaller incisions, reducing surgical trauma, avoiding excessive deltoid muscle injury, and alleviating postoperative obstruction of glenoid movement. However, due to the limited joint cavity space and poor visualization provided by small incisions, it is not conducive to the overall quality of glenoid tissue repair. With the development of arthroscopic technology in recent years, arthroscopic surgery for glenoid injuries has become more prevalent, characterized by minimal trauma, effectively reducing intraoperative bleeding and postoperative pain, clearly showing the shape and extent of glenoid injuries, providing good operating space for the tenosynovial region, creating an effective environment for tendon insertion repair, which is more conducive to restoring glenoid mechanical balance, maintaining shoulder stability, and ensuring clinical outcomes. Additionally, arthroscopic surgery can reduce damage to the deltoid muscles in the shoulder area, minimize pain, avoid postoperative pain and swelling, facilitate wound healing, and accelerate recovery.

Zhang Kaikai[4]Scholars reported that arthroscopic minimally invasive treatment can effectively reduce the degree of patient pain, improve quality of life, restore shoulder joint movement and function, and enhance clinical efficacy. Arthroscopic surgery is a minimally invasive surgical method with very small incisions, causing less trauma to patients,

resulting in relatively less pain and discomfort during postoperative recovery, accelerating wound healing and shortening the postoperative recovery period. Patients can undergo physical therapy and rehabilitation exercises early to restore glenoid stability and increase muscle strength. The small surgical trauma also reduces the risk of adverse complications such as infection and nerve damage caused by incisions. Under the arthroscopic view, medical staff can accurately monitor glenoid injuries and precisely measure the severity of glenoid injuries, facilitating correct observation and assessment of the patients condition to choose between repair, suturing, or reconstruction. By expanding the monitoring scope, detailed repairs can be made for glenoid muscle tears, increasing the surgical field of view and clarity through endoscopy, performing operations within the glenoid joint region via small incisions, and using specialized equipment for suturing, effectively repairing the local joint, reshaping the glenoid tendon morphology, enhancing glenoid stability, restoring mobility, improving repair accuracy and success rates, minimizing the risk of complications such as infection and nerve damage, achieving good therapeutic outcomes. Multiple clinical studies have shown thisIt has been shown that arthroscopic surgery is applicable to various types of rotator cuff injuries including sports-related rotator cuff tendon injuries heavy physical labor rotator cuff injuries and elderly degenerative rotator cuff injuries. Arthroscopic surgery can reshape or suture ruptured or fragmented rotator cuff tendons eliminate inflammatory substances within the joint and resolve conflicts between the clavicle and coracoid process[5]. In addition, arthroscopic surgery can assist in the rapid recovery of rotator cuff injuries, reconnecting the rotator cuff tendons, eliminating rotator cuff pain, and improving comfort. It is also more conducive to patients starting postoperative rehabilitation exercises earlier to increase the range and intensity of shoulder cuff activities, consolidate the repair results, and gradually restore shoulder joint function.

2 Progress in rehabilitation treatment

2.1 Exercise rehabilitation treatment

The treatment of rotator cuff injury is a complex process, in addition to surgical treatment, postoperative rehabilitation is also required to consolidate the therapeutic effect. Studies have shown that collagen protein arrangement and tissue structure form by the 8th week after surgery, and it is not until the 12th week that Sharpey fibers connecting tendons and bones begin to appear in large numbers[6].Therefore, within 12 weeks postoperatively, excessive stress should be reduced to avoid affecting the repair site. For this purpose, shoulder cuff injury postoperative exercise can be divided into a progressive phase:

(1) immobilization and bracing. According to conventional theory, early passive movement after surgery is beneficial for reducing postoperative stiffness, but recent animal model studies have shown that immediate movement is not effective. Gong Jiayu[7]Studies have reported that compared to early activities, patients in the fixed period exhibit more increased type I collagen tissue and less scar formation. Postoperative immobilization for two weeks facilitates the extracellular matrix to exhibit similarities with undamaged tissues, enhancing tissue quality. The low load under immobilization also ensures a protective environment for the shoulder joint, accelerating the effective integration of tendons and bones.

(2) Passive activities. Generally performed 4-6 weeks after the fixation period, aiming to minimize the activation and strain on the repaired tissue, thus starting with passive activities followed by active ones. Tang Li[8]Studies have shown that applying a step-by-step rehabilitation approach can accelerate the functional recovery of the shoulder joint in patients with arthroscopic rotator cuff injuries. When lying supine, a support can be placed under the elbow to assist the supraspinatus tendon. When passively elevating the scapular plane, efforts should be made to provide passive range of motion within the scapular plane to minimize stress. When increasing the range of motion of the glenohumeral joint, it should not exceed the first resistance point to avoid discomfort such as pain at the distal end. Internal rotation stretching increases strain and helps patients achieve proper shoulder elevation, external rotation, and automatic swinging. During rotator cuff exercises, the humeral head should remain centered to avoid upward impact on the subacromial ligament healing tissue.

(3) Active Movement. When the patients pain significantly decreases and the scapular passive joint movement reaches 120 degrees of elevation, active movements can begin, including supine bar flexion, gradual tilting bar flexion, standing assisted flexion, and rolling ball exercises. Using a towel wall slide within the scapular plane can accelerate shoulder stabilator contraction, followed by wall slide descent and eccentric lowering to actively flex the shoulder in the scapular plane to enhance range of motion. (4) Strength Training. As the rehabilitation program progresses, shoulder cuff exercises should be intensified. Duan Yingxiao[9]According to reports, strength training after arthroscopic rotator cuff injury surgery can effectively improve shoulder joint range of motion. External rotation and abduction at 90 degrees, lateral external rotation, and lateral external rotation while lying on the side can achieve maximum activation of the infraspinatus muscle. The rhomboids play a role in scapular traction and compression, and activities such as wall slides, internal and external rotation while lying prone, bilateral external rotation, and external rotation while lying prone can all increase the

electromyographic activity of the rhomboids, thereby enhancing shoulder strength.

2.2 Physical rehabilitation treatment

This method can reduce the patients pain, reduce adhesion, accelerate tendon healing and restore shoulder joint movement. Extracorporeal shock wave is a common physical therapy method, Li Yuzhen[10]According to reports, extracorporeal shock wave therapy can effectively improve shoulder function and accelerate recovery in patients after rotator cuff repair surgery. When applied to the affected area of the shoulder, extracorporeal shock waves can transmit energy within the body, causing relevant energy conversion. During this process, tissues of different densities undergo physical changes, primarily characterized by energy traction and gradient differences, which lead to biological changes such as adhesion separation, contracture extension, and accelerate local microcirculation. Additionally, it can stimulate nerves and inhibit the transmission of cardiac electrical impulses, thereby achieving analgesic effects and symptom relief.

2.3 Traditional Chinese medicine rehabilitation treatment

In Traditional Chinese Medicine (TCM), shoulder cuff injuries are categorized under conditions such as Luoshanfeng and Jianbi, with the pathogenesis attributed to blood stasis, muscle stiffness, and joint pain due to obstruction of circulation. Factors influencing these conditions include age, blood and qi status, external trauma, and chronic overuse. Therefore, the principle should be to promote blood circulation and unblock meridians.

(1) Internal TCM treatment. This primarily involves the use of decoctions based on the patients symptoms. TCM typically classifies shoulder cuff injuries into types such as cold-dampness obstructing the meridians, qi stagnation and blood stasis, and deficiency of both qi and blood. Zhang Fengyi[11]According to reports, modified Gui Zhi Decoction has the effects of unblocking meridians and removing blood stasis in patients with shoulder cuff injury caused by cold-dampness obstruction. Han Huangwei[12]Application of modified Jingyuan Huoxue Decoction in patients with adhesive capsulitis and arthroscopic surgery was reported to effectively improve shoulder joint score, flexion and abduction degree. Chen Xiaojiang[13]According to reports, Jingyi Qitong Buxue Decoction can directly repair damaged tissues in patients with qi and blood deficiency, improve shoulder joint function, reduce pain, and significantly improve patient conditions, enhancing clinical efficacy. It is evident that the multiple pharmacological effects of traditional Chinese medicine can exert warming the meridians and dispelling cold, removing dampness and promoting circulation, unblocking meridians and activating collaterals, thereby alleviating symptoms of pain and stiffness caused by qi stagnation, thus improving shoulder movement function.

(2) Massage therapy. This is a traditional Chinese medical technique based on meridian theory and acupoint theory, aimed at unblocking meridians, promoting qi flow, relieving pain, accelerating metabolism, and eliminating muscle fatigue. It is used to adjust the glenohumeral joint and shoulder-glenoid joint rhythm, restore balance in the scapular muscles, accelerate the absorption of inflammatory factors, and relieve pain. Zhang Shunhua[14]According to reports on the application of massage therapy for patients with rotator cuff injuries, it can alleviate pain in the patients body and promote shoulder function recovery. Specifically, through pressing, kneading, and tapping techniques, it helps patients relax muscles, promotes blood circulation, and accelerates recovery. Additionally, techniques such as stretching, manipulation, rolling, grasping, and rubbing can be used, which are more suitable for rehabilitation treatment of patients with acute rotator cuff injuries and long-term overuse injuries.

(3) Acupuncture therapy. acupuncture. Acupuncture can accelerate local tissue metabolism, control peripheral inflammatory responses, speed up inflammation absorption, and improve edema and pain conditions. Sang Yanan[15]Research on acupuncture treatment for rotator cuff injuries shows that it can effectively improve shoulder joint function and range of motion reduce CRP and TNF-α levels. Selecting Neiguan (PC6), Jianzhen (SI14), Jianqian (SI20), Jianyu (SI23), and Jianliao (SI24) acupoints can unblock meridians promote blood circulation and resolve stasis reduce adhesion and spasm of surrounding soft tissues around the injured shoulder joint improve blood circulation and shoulder range of motion. needle knife therapy can harmonize yin and yang expel pathogens and support the body relieve muscle spasms is highly safe and easily accepted by patients. Wang Jiaoyun[16]The study on the application of needle knife release technique for treating rotator cuff injuries shows that it can effectively alleviate patient pain and improve shoulder joint function. The needle knife can improve the soft tissues around the joint, promoting blood circulation and restoring nutrition to painful points and local acupoints. It can also relax tense and spasmodic muscles through acupuncture effects, achieving the effect of dispelling evil and supporting the body. (4) Chinese herbal fumigation. This method is an external treatment approach that can harmonize qi and blood, unblock meridians, activate blood circulation, resolve stasis, support the body, dispel evil, and relieve pain. Chen Dan[17]The research on the treatment of rotator cuff injuries with traditional Chinese medicine fumigation shows that it can effectively improve patients VAS, CMS scores, and abduction, flexion, and external rotation activities. Traditional Chinese medicine fumigation involves using herbs such as safflower, myrrhiah, and kudzu root, which have blood-activating and stasis-resolving properties, as well as anti-

inflammatory effects. After heating, these herbs are used to fumigate the affected shoulder area through steam inhalation, allowing them to penetrate the skin and be absorbed by the body, thereby exerting their pharmacological and thermal effects to accelerate shoulder circulation and the absorption of inflammatory factors, loosen adhesions in the shoulder, and alleviate pain. This therapy is relatively mild and can effectively improve patient injury conditions and joint mobility, making it highly acceptable for patients.

3 Summary

As can be seen from the review, in addition to surgical treatment for rotator cuff injuries, postoperative rehabilitation is equally crucial. Arthroscopic surgery has the advantages of minimal invasiveness, fewer complications, and rapid recovery, effectively enhancing treatment outcomes. Combined with progressive physical exercises, extracorporeal shock wave therapy, and traditional Chinese medicine rehabilitation methods such as acupuncture, moxibustion, needle knife therapy, and fumigation, these treatments can better promote the recovery of the rotator cuff.

Rehabilitation of injured patients. In the future, more research on treatment and rehabilitation of rotator cuff injury can be carried out, and multidisciplinary cooperation should be strengthened to optimize treatment plans and provide more powerful reference for rotator cuff injury treatment.

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